Balanced Scorecard
Spring, 2003
J. Hill

Plan for an Aging Facility

This plant was designed for a thirty-year life but, from the beginning, it was realized that the expectations were for more. We are rapidly approaching the 20-year in-service anniversary of both units and as expected, time and operation have started to take its toll. We at IPSC have always had the goal to maintain the plant in "Like New" condition while at the same time realizing the difficulty of that goal. However; it is possible to manage the aging process to have the least amount of impact possible on availability while controlling operating costs. It would be of no benefit to maintain our historic high availability numbers if our operating costs became so high that we were no longer competitive. We are constantly seeking for ways to balance budget concerns while striving for ever more difficult availability.

The methods we are currently using to extend the life of the facility and manage the aging resources we have to work with can be summarized into four basic categories:

- Constrained and Prudent Operation
- On-line Predictive Technologies and off-line Inspections and Testing
- Preventive and Scheduled Maintenance
- Planned Renewals and Replacements

Constrained and Prudent Operation

Equipment designed for thirty years and properly maintained can be worn out in ten years if is poorly or incorrectly operated. On the other hand, equipment operated within its limits and properly maintained can be serviceable almost indefinitely. Proper operation of the Intermountain Power Facilities is the most cost effective life extension program available. At IPSC we are constantly training and retraining on the proper operation of our facilities. We have many information tools available to monitor operation and they are widely used by the hands-on Operators, Engineers and Managers to constrain operation within the limits of the equipment. Even with the plant uprate to 950 MW for each unit, we expect our Operators to run the equipment within the established operating parameters.

This is not an easy task for complicated systems such as the coal fired boiler and steam turbine. Minor excursions in steam and flue gas temperature over the design limits can have significant reductions in metal component life. One boiler chemistry excursion can take decades of life off of the boiler tube metals. It takes the efforts of many to insure that these limits are not exceeded.

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On-line Predictive Technologies and off-line Inspections and Testing

Since the units are operating more than 90% of the time, it is imperative to have the methods, equipment and trained personnel to perform on-line predictive testing. This testing can generally tell the condition of most pieces of equipment without jeopardizing availability. The idea is to catch a problem while it is small and fix it before it becomes a large one. The on-line technologies utilized at IPSC include:

- Vibration Monitoring
- Lube Oil Testing
- Infrared Scanning
- Motor Current Signature Analysis
- Performance Monitoring

When a unit is removed from service, all areas of the plant are inspected and tested to determine areas of concern and methods of life extension. For example, the high pressure piping and boiler tubes are tested each major outage to find cracks before they spread and to map areas of metal loss so that corrective actions can be taken.

An eddy current inspection of the circulating water lines this last outage on both units indicates that we have large areas of failure. Early detection of these failures allow us to make repairs on our time schedule and at the least amount of cost possible.

Preventive and Scheduled Maintenance

Despite all of the many advances in predictive technologies, preventive maintenance is still the backbone of any well running plant. At this point, we have enough operating history to have developed cost-effective schedules for preventive and scheduled maintenance.

Planned Renewals and Replacements

Despite all of our efforts to extend the life of equipment, sometime the only thing that can be done is a capital renewal or replacement. A list of the anticipated major capital projects and purchases over the next ten years is attached. Some of the major items on the list are:

Generator Rewinds
Cooling Tower Renovations
Distributed Control System Replacement
Replacement ID Fan Drives
Scrubber Outlet Duct Renewal
Superheater Tube Replacement
Coal Dozer Replacement

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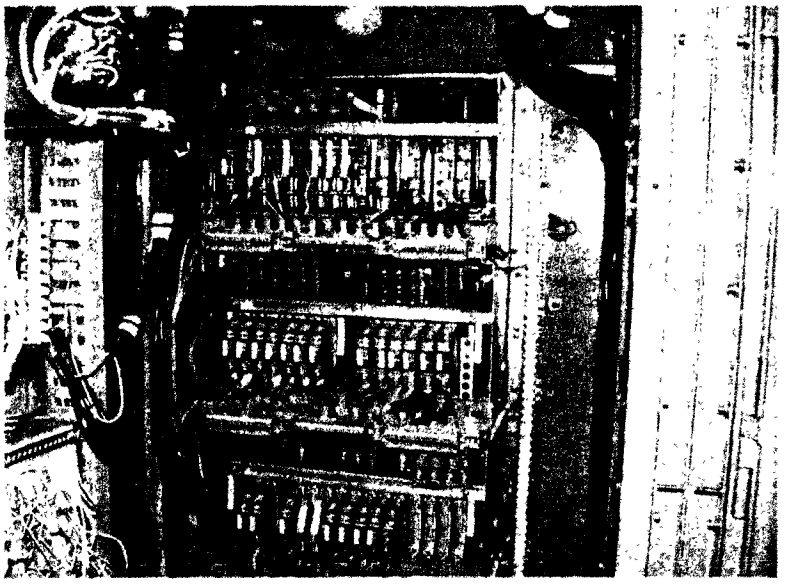
Aging Plant Plan
Converter Station Section

There are four items of concern for the Converter Station concerning aging equipment. The Control Systems, RTV on the Wall Bushings the Cooling Towers and the SF6 Gas Cart.

DC Control Systems

The Control Systems for the operation of the Intermountain and Adelanto Converter Stations were designed in the early 1980's and are now over 20 years old. The reliability of the existing controls is good, but spare parts are now getting hard to acquire. ABB the manufacturer of the station still supports the system, but lead time to receive replacement control cards and power supplies is approximately 6 to 8 months. Presently ICS has capital spares for each of the cards used in the control system, but if multiple cards fail, the operation of the station could be compromised. The cost of replacement for a typical card has also increased from approximately $1,300 to $3,500. The approximate cost in today's dollars for replacement of control systems is $10 million for Intermountain and $10 million for Adelanto. It is recommended that the controls be replaced in 2010. Below is a photograph of one of the Pole Controls systems which would be replaced.



Pole 1 Pole Control

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Status of Unit 1 Uprate- Availability for 950 MW

The uprate of Unit 1 to 950 MW is on schedule for completion by the end of the Major Outage. The Alstom HP Turbine installation was installed according to plan and schedule, with no surprises or problems. The Overfire Air system for the boiler was installed ahead of schedule and will be available for post-outage testing. The helper cooling tower will not be available until mid-May, but it is not needed for unit operation until summer weather conditions require it. The Scrubber Forced Air Oxidation System was completed in four of the six module reaction tanks during the Unit 1 Outage.

Other projects completed during the March Major Outage on Unit 1 to allow operation at 950 MW include:

- Additional Transformer Cooling
- Isophase Busduct Cooling System
- Additional Main Steam Safety Valves
- Generator Monitoring System
- High Pressure Heater Drain Line Stabilization
- Boiler Feed Pump Performance Upgrade

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Customer
Objective: Maintain best in class in availability and performance.
Initiative: Identify, analyze, and report best practices to improve indicators.

Plan for Improved Availability and Performance

IPSC continues to maintain high availability and performance numbers. Plant availability for the 2002-03 fiscal year, just completed, is at 93%, while net capacity and output factors are at 90% and 97% respectively. The high availability and performance numbers are primarily due to the programs that are currently in place, but are also due to our ongoing commitment to participate and review industry best practices and to improve upon our programs as is practicable.

IPSC staff and employees participate each year in the semiannual FOMIS "Best Practices" conferences. These conferences include management personnel from coal facilities across the country and frequently include participants from Europe and Japan. Agendas for these meetings are put together and typically presented by the participants. The conferences include discussions of success stories, and failures, and focus on what the industry is doing to improve in all areas of plant practices.

Currently IPSC programs focused at improving plant availability and performance include the following:

- A Performance Engineering Section is established within Technical Services, consisting of engineers and technical analysts who routinely test and monitor key plant parameters for performance, availability, and reliability.
- A Predictive Maintenance Group, which includes Maintenance and Technical Services personnel, is established and meets monthly to review performance, availability and reliability issues. The plant Predictive Maintenance Program includes vibration, lubrication, thermographic analyses, performance testing, and specific plant equipment testing. Results from the group are reviewed, published, and implemented monthly.
- Specific working groups, consisting of Maintenance, Operations, and Technical Services personnel, are established as needed to deal with specific plant problem areas. Currently, there are two groups established, a Scrubber Working Group and a Pulverizer Working Group, each meeting weekly to review and coordinate efforts.
- A Failure Analysis Program is in place to review and report on unit trips and major equipment failures. Operations and Technical Services usually have the lead to gather data, to review events, to discuss results, to make recommendations, and to prepare the final reports. Recommendations are implemented as soon as possible after the events.

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Customer
Objective: Maintain best in class in availability and performance.
Initiative: Develop a written pulverizer maintenance plan.

Pulverizer Maintenance Plan

It will be the policy of IPSC to maintain coal pulverizers in a way to avoid or minimize operating with fewer than seven pulverizers in service. Historically it has been possible to obtain Unit full load at 875 MW with six pulverizers. With a Unit rating of 950 MW it is likely that at six pulverizers a Unit would be curtailed to approximately 925 MW. Using current economic factors for replacement power ($25/MWH) the cost would be $15,000 per day.

It will be necessary to have a firm schedule for major overhauls, minor inspections, and repairs that will allow no more than six weeks per pulverizer, per year. This is based on the increased frequency of maintenance due to the aging of the equipment and the abrasive quality of the coal. The quality of the work and parts must be such that when a pulverizer is returned to service it will operate effectively until the next scheduled outage.

IPSC Maintenance plans to establish a semipermanent Pulverizer Crew for each Unit. This will provide improved safety, reliability, and work efficiency. With a permanent crew we will be able to meet current training needs and have uniform employee skill levels and procedures.

Other efforts have been made and are ongoing to improve pulverizer maintenance effectiveness and operating reliability. These activities are listed below:

- IPSC has entered into a Master Supply Agreement for pulverizer parts with AR Industries, a Division of Alstom Power, Inc.
- The pulverizer working platform and stairway access is being modified for safety and efficiency.
- Equipment is being evaluated for use to remove and replace parts for the pulverizers.
- A weekly pulverizer meeting involving Maintenance, Planning, Operations, and Technical Services has been effective and will be continued.
- Static or Rotating Classifiers are being reviewed for a possible increase in throughput.
- Rotating throats are being installed and evaluated. The five that are installed have proven to reduce Pulverizer Maintenance. The useful life of rotating throats is approximately eight years compared to two years for fixed throats.